~~Claims~~
WHAT IS CLAIMED IS:

1. Device for shaping objects by removal of material from the surface thereof with a pulsed laser beam and a deflecting device through which the laser beam is guided over the surface of the object, characterized in that an optical device (14) is provided for changing the distribution of the radiation intensity inside the laser beam cross section and, after the passage of the laser beam (2) through this optical device (14), the radiation intensity has a bell-shaped or Gaussian distribution, or a distribution similar to a bell-shaped or Gaussian distribution, in at least one cross-sectional direction through the laser beam (2).

2. Device according to claim 1, characterized in that the optical device (14) comprises at least one optical element (15) which can be selectively introduced into or removed from the laser beam path for the purpose of changing the intensity distribution, wherein the at least one optical element (15) is provided with a diffractive and/or refractive microoptically active structure which is suitable for influencing the intensity distribution in the laser radiation cross section.

3. Device according to claim 2, characterized in that an optical element (15) is provided which generates a radially symmetric intensity distribution within the laser beam cross section in which an approximately equal intensity is present in a circular central cross-sectional area and an intensity falling in a bell shape or Gaussian shape is present from the central cross-sectional area to the edge regions of the laser beam.

4. Device according to claim 2, characterized in that an optical element (15) is provided which generates a radially symmetric intensity distribution within the laser beam cross section in which an intensity maximum is present in the center of the cross section and an intensity falling in a bell-shaped or Gaussian manner is present proceeding from the center to the edge regions.

5. Device according to claim 2, characterized in that an optical element (15) is provided for generating different intensity distributions in different cross-sectional directions through the laser beam.

6. Device according to claim 5, characterized in that the optical element (15) is formed in such a way that, in two sections through the laser beam (2) which are perpendicular to one another, an at least approximately Gaussian intensity distribution is achieved in one section and an at least approximately homogeneous intensity distribution is achieved in the second section, wherein the deflecting direction is oriented at right angles to the homogeneous intensity distribution.

7. Device according to one of the preceding claims, characterized in that the optical device (14) comprises a plurality of optical elements (15) which are arranged on a movable carrier and the optical elements (15) can be introduced into the laser beam (2) or removed from the laser beam (2) by the movement of the carrier.

8. Device according to claim 7, characterized in that the movable carrier is constructed as a rotatable exchange wheel (16) which is mounted so as to be rotatable about an axis of rotation (17) oriented parallel to the beam direction and on which the optical elements (15) are arranged along a partial circle.

9. Device according to one of the preceding claims, characterized in that a variable optical system is provided in the laser beam path for influencing the size of the spot area directed onto the surface of the object.

10. Device according to claim 9, characterized in that the size of the spot area is adapted to the deflection angle of the laser beam between two consecutive pulses and to the pulse frequency of the laser beam in such a way that the individual spot areas overlap by about 30% on the surface of the object.

11. Device according to claim 10, characterized in that the variable system and/or the exchange wheel (16) are provided with electronically controllable actuating drives whose control inputs (21, 22), along with a control input (23) of the deflecting device (4), are connected with outputs of a control unit (24), wherein preset data for the size of the spot area and/or for the rotating movement of the exchange wheel (16) and/or for the deflecting angle are applied to the outputs of the control unit (24).

12. Device according to claim 11, characterized in that a device is provided for detecting actual values of curvature of individual surface portions and/or of the entire surface to be treated, this device being coupled with an actual-value storage.

13. Device according to claim 11 or 12, characterized in that the control unit (24) is connected on the input side with the actual-value storage and a reference value storage, and a computation circuit is provided in the control unit (24) for determining preset data for the size of the spot area and/or for the rotating movement of the exchange wheel (16) and/or for the deflecting angle of the laser beam (2) from comparison of the actual values with the reference values.

14. Process for shaping objects through material removal from the surface of the object by means of a pulsed laser beam which is guided over the object surface, characterized in that the distribution of the radiation intensity within the laser beam (2) and/or the size of the spot area with which the laser beam (2) strikes the object surface and/or the deflecting angle for the laser beam (2) are changed during the shaping.

15. Process according to claim 14, characterized in that the material removal is carried out with a small spot area at the start of the shaping and the material removal is carried out with an increasingly large spot area at the end of the shaping.

16. Process according to claim 14 or 15, characterized in that, in the final phase of shaping, the material removal is carried out with a spot area whose size corresponds to the total size of the object surface to be treated.

17. Process according to claims 14 to 16, characterized in that the material removal is carried out with a pot-shaped intensity distribution at the start of shaping and material removal is carried out with an increasingly Gaussian intensity distribution at the end of shaping.

18. Process for determining geometric changes at the surface of objects during operation of a device according to claims 1 to 13, characterized in that a curvature measurement of individual surface portions and/or of the entire surface to be treated is carried out before, during and/or immediately after material removal.

19. Process according to claim 18, characterized in that a measurement beam path or a plurality of measurement beam paths is/are directed onto the surface of the object for the purpose of curvature measurement, wherein the surface of the object detects the reflections of these measurement beam paths by means of a detector device and curvature values are determined therefrom by means of an evaluating device.

20. Process according to one of claims 18 or 19, characterized in that the determined curvature values for the entire surface or for individual surface portions of the object to be treated are used as actual values as the basis for a comparison with reference values for the total surface or individual surface portions.

21. Process according to claim 20, characterized in that preset data are obtained from a comparison of the actual values with reference values for a subsequent material removal which is limited with respect to time, wherein the deflecting angle of the laser beam between two successive pulses and/or the size

of the spot area on the object surface and/or the intensity distribution within the laser beam (2) are predetermined for the subsequent removal of material by the preset data.